

COMPOSITION FOR THE OXIDATION DYEING OF KERATIN FIBRES
AND DYEING PROCESS USING THIS COMPOSITION

The invention relates to a composition for
5 the oxidation dyeing of keratin fibres, and in
particular human keratin fibres such as the hair,
comprising, in a medium which is suitable for dyeing,
at least one oxidation base, at least one
3-aminopyridine derivative as direct dye, and at least
10 one substituted meta-aminophenol as coupler, as well as
to the dyeing process using this composition.

It is known practice to dye keratin fibres,
and in particular human hair, with dye compositions
containing oxidation dye precursors, in particular
15 ortho- or para-phenylenediamines, ortho- or para-
aminophenols and heterocyclic bases, which are
generally referred to as oxidation bases. Oxidation dye
precursors, or oxidation bases, are colourless or
weakly coloured compounds which, when combined with
20 oxidizing products, can give rise to coloured compounds
and dyes by a process of oxidative condensation.

It is also known that the shades obtained
with these oxidation bases can be varied by combining
them with couplers or colour modifiers, the latter
25 being chosen in particular from aromatic meta-diamines,
meta-aminophenols, meta-diphenols and certain
heterocyclic compounds.

The variety of molecules used as regards the oxidation bases and couplers allows a wide range of colours to be obtained.

It is also known that, in order to vary the 5 shades obtained even more and to give them glints, it is possible to use, in combination with the oxidation dye precursors and couplers, direct dyes, i.e. coloured substances which provide a coloration in the absence of an oxidizing agent.

10 The great majority of these direct dyes belong to the family of nitrobenzene compounds and have the drawback, when they are incorporated into dye compositions, of leading to colorations that are not sufficiently fast, in particular with respect to 15 shampoos.

The so-called "permanent" coloration obtained by means of these oxidation dyes must moreover satisfy a certain number of requirements. Thus, it must be able to give shades of the desired intensity and it must be 20 able to withstand external agents (light, bad weather, washing, permanent-waving, perspiration and rubbing).

The dyes must also make it possible to cover white hair, and, finally, they must be as unselective as possible, i.e. they must give the smallest possible 25 differences in colour all the way along the same keratin fibre, which may indeed be differently sensitized (i.e. damaged) between its tip and its root.

Compositions for the oxidation dyeing of keratin fibres containing a combination of a benzenic oxidation base, a direct dye of the 3-aminopyridine family and an unsubstituted meta-aminophenol as coupler 5 have already been proposed, in particular in patent application FR-A-2,285,851. However, the colorations obtained using such compositions are not entirely satisfactory, in particular from the point of view of their chromaticity and their fastness.

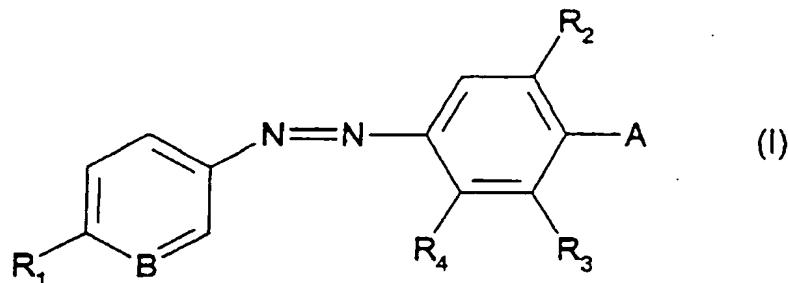
10 The Applicant has now discovered that it is possible to obtain novel dyes which are capable of giving intense and chromatic colorations, which show little selectivity and which satisfactorily withstand the various attacking factors to which the fibres may 15 be subjected, by combining at least one oxidation base, at least one suitably selected 3-aminopyridine derivative as direct dye, and at least one suitably selected meta-aminophenol derivative.

20 This discovery forms the basis of the present invention.

A first subject of the invention is thus a composition for the oxidation dyeing of keratin fibres, and in particular of human keratin fibres such as the hair, characterized in that it comprises, in a medium 25 which is suitable for dyeing:

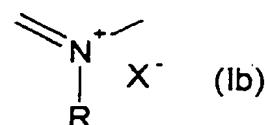
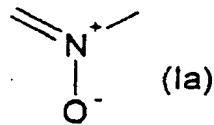
- at least one oxidation base,

- as direct dye, at least one 3-aminopyridine derivative chosen from the compounds of formula (I) below:



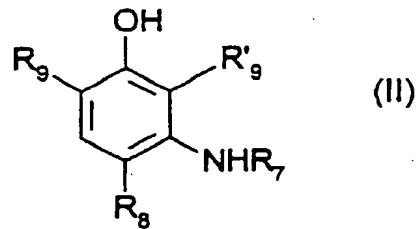
5 in which:

- B represents a group of formula (Ia) or (Ib) below:



- R represents a C₁-C₄ alkyl radical;
- R₁ represents a hydrogen or halogen atom such as chlorine, bromine or fluorine, or a C₁-C₄ alkyl or C₁-C₄ alkoxy radical;
- R₂ represents a hydrogen atom or a C₁-C₄ alkyl or C₁-C₄ alkoxy radical;
- R₄ represents a hydrogen or halogen atom such as chlorine, bromine or fluorine, or a C₁-C₄ alkyl, nitro, amino or (C₁-C₄)acylamino radical;
- R₃ represents a hydrogen atom or else R₄ and R₃ together form a 6-membered unsaturated ring bearing a hydroxyl substituent chelated with one of the nitrogen atoms of the azo double bond;

- A represents a residue $-NR_5R_6$ in which R_5 represents a hydrogen atom or a C_1-C_4 alkyl, C_1-C_4 monohydroxyalkyl or C_2-C_4 polyhydroxyalkyl radical; R_6 represents a hydrogen atom, a C_1-C_4 alkyl, C_1-C_4 monohydroxyalkyl or C_2-C_4 polyhydroxyalkyl radical, a phenyl ring or a $-CH_2-SO_3Na$ radical;
- X^- represents a monovalent or divalent anion and is preferably chosen from a halogen atom such as chlorine, bromine, fluorine or iodine, a hydroxide, a hydrogen sulphate or a (C_1-C_6) alkyl sulphate such as, for example, a methyl sulphate or an ethyl sulphate, and
- at least one coupler chosen from the meta-aminophenol derivatives of formula (II) below, and the addition salts thereof with an acid:



in which:

- R_7 represents a hydrogen atom or a C_1-C_4 alkyl, C_1-C_4 monohydroxyalkyl, C_2-C_4 polyhydroxyalkyl or C_1-C_4 monoaminoalkyl radical;
- R_8 represents a hydrogen atom, a C_1-C_4 alkyl or C_1-C_4 alkoxy radical or a halogen atom chosen from chlorine, bromine and fluorine,

- R_9 and R'_9 , which may be identical or different, represent a hydrogen or halogen atom or a C_1 - C_4 alkyl, C_1 - C_4 alkoxy, C_1 - C_4 monohydroxyalkyl, C_2 - C_4 polyhydroxyalkyl, C_1 - C_4 monohydroxyalkoxy or C_2 - C_4 polyhydroxyalkoxy radical;

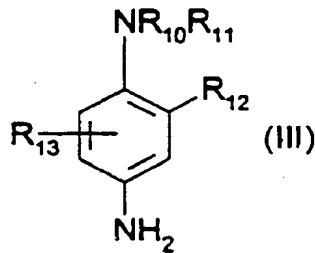
5 it being understood that at least one of the radicals R_7 , R_8 , R_9 and R'_9 , is other than a hydrogen atom.

The dye composition in accordance with the invention gives intense, chromatic colorations which 10 show little selectivity and excellent properties of resistance both with respect to atmospheric agents such as light and bad weather, and with respect to perspiration and the various treatments to which the hair may be subjected. These properties are 15 particularly noteworthy as regards the chromaticity.

A subject of the invention is also a process for the oxidation dyeing of keratin fibres using this dye composition.

The nature of the oxidation base(s) used in 20 the ready-to-use dye composition is not critical. They can be chosen, in particular, from para-phenylenediamines, double bases, para-aminophenols, ortho-aminophenols and heterocyclic oxidation bases.

Among the para-phenylenediamines which can be 25 used as oxidation base in the dye compositions in accordance with the invention, mention may be made in particular of the compounds of formula (III) below, and the addition salts thereof with an acid:



in which:

- R_{10} represents a hydrogen atom or a C_1 - C_4 alkyl radical, C_1 - C_4 monohydroxyalkyl radical, C_2 - C_4 5 polyhydroxyalkyl radical, $(C_1$ - $C_4)$ alkoxy(C_1 - C_4) alkyl radical, C_1 - C_4 alkyl radical substituted with a nitrogenous group, phenyl or 4'-aminophenyl;
- R_{11} represents a hydrogen atom or a C_1 - C_4 alkyl radical, C_1 - C_4 monohydroxyalkyl radical, C_2 - C_4 10 polyhydroxyalkyl radical, $(C_1$ - $C_4)$ alkoxy(C_1 - C_4) alkyl radical or C_1 - C_4 alkyl radical substituted with a nitrogenous group;
- R_{12} represents a hydrogen atom, a halogen atom such as a chlorine, bromine, iodine or fluorine atom, or a 15 C_1 - C_4 alkyl radical, C_1 - C_4 monohydroxyalkyl radical, C_1 - C_4 hydroxyalkoxy radical, acetylamino(C_1 - C_4) alkoxy, mesylamino(C_1 - C_4) alkoxy or carbamoylamino(C_1 - C_4) alkoxy radical,
- R_{13} represents a hydrogen or halogen atom or a C_1 - C_4 20 alkyl radical.

Among the nitrogenous groups of formula (III) above, mention may be made in particular of amino, mono(C_1 - C_4) alkylamino, di(C_1 - C_4) alkylamino,

tri(C₁-C₄)alkylamino, monohydroxy(C₁-C₄)alkylamino, imidazolinium and ammonium radicals.

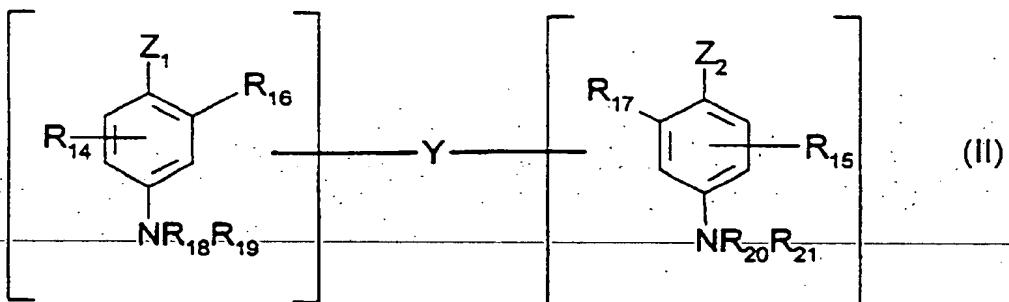
- Among the para-phenylenediamines of formula (III) above, mention may be made more particularly of
- 5 para-phenylenediamine, para-tolylenediamine, 2-chloro-para-phenylenediamine, 2,3-dimethyl-para-phenylenediamine, 2,6-dimethyl-para-phenylenediamine, 2,6-diethyl-para-phenylenediamine, 2,5-dimethyl-para-phenylenediamine, N,N-dimethyl-para-phenylenediamine,
- 10 N,N-diethyl-para-phenylenediamine, N,N-dipropyl-para-phenylenediamine, 4-amino-N,N-diethyl-3-methylaniline, N,N-bis(β-hydroxyethyl)-para-phenylenediamine, 4-N,N-bis(β-hydroxyethyl)amino-2-methylaniline, 4-N,N-bis(β-hydroxyethyl)amino-2-chloroaniline, 2-β-hydroxyethyl-para-phenylenediamine, 2-fluoro-para-phenylenediamine,
- 15 2-isopropyl-para-phenylenediamine, N-(β-hydroxypropyl)-para-phenylenediamine, 2-hydroxymethyl-para-phenylenediamine, N,N-dimethyl-3-methyl-para-phenylenediamine, N-ethyl-N-(β-hydroxyethyl)-para-phenylenediamine, N-(β,γ-dihydroxypropyl)-para-phenylenediamine, N-(4'-aminophenyl)-para-phenylenediamine, N-phenyl-para-phenylenediamine, 2-β-hydroxyethoxy-para-phenylenediamine, 2-β-acetylaminooethoxy-para-phenylenediamine and N-(β-methoxyethyl)-para-phenylenediamine, and the addition salts thereof with an acid.

Among the para-phenylenediamines of formula (III) above, the ones most particularly preferred are

- para-phenylenediamine, para-tolylenediamine,
 2-isopropyl-para-phenylenediamine, 2- β -hydroxyethyl-
 para-phenylenediamine, 2- β -hydroxyethoxy-para-
 phenylenediamine, 2,6-dimethyl-para-phenylenediamine,
 5 2,6-diethyl-para-phenylenediamine, 2,3-dimethyl-para-
 phenylenediamine, N,N-bis(β -hydroxyethyl)-para-
 phenylenediamine, 2-chloro-para-phenylenediamine and
 2- β -acetylaminooethoxy-para-phenylenediamine, and the
 addition salts thereof with an acid.

10 According to the invention, the term "double bases" means compounds comprising at least two aromatic nuclei on which amino and/or hydroxyl groups are borne.

Among the double bases which can be used as oxidation bases in the dye compositions in accordance with the invention, mention may be made in particular of the compounds corresponding to the formula (IV) below, and the addition salts thereof with an acid:



in which:

- 20 - Z₁ and Z₂, which may be identical or different, represent a hydroxyl or -NH₂ radical which can be substituted with a C₁-C₄ alkyl radical or with a linker arm Y;

- the linker arm Y represents a linear or branched alkylene chain comprising from 1 to 14 carbon atoms, which can be interrupted or terminated with one or more nitrogenous groups and/or with one or more 5 hetero atoms such as oxygen, sulphur or nitrogen atoms, and optionally substituted with one or more hydroxyl or C₁-C₆ alkoxy radicals;
- R₁₄ and R₁₅ represent a hydrogen or halogen atom, a C₁-C₄ alkyl radical, C₁-C₄ monohydroxyalkyl radical, 10 C₂-C₄ polyhydroxyalkyl radical or C₁-C₄ aminoalkyl radical or a linker arm Y;
- R₁₆, R₁₇, R₁₈, R₁₉, R₂₀ and R₂₁, which may be identical or different, represent a hydrogen atom, a linker arm Y or a C₁-C₄ alkyl radical;
- 15 it being understood that the compounds of formula (IV) comprise only one linker arm Y per molecule.

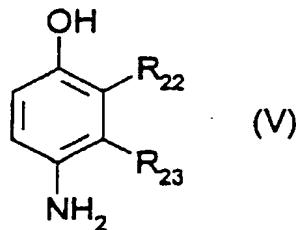
Among the nitrogenous groups of formula (IV) above, mention may be made in particular of amino, mono(C₁-C₄)alkylamino, di(C₁-C₄)alkylamino, 20 tri(C₁-C₄)alkylamino, monohydroxy(C₁-C₄)alkylamino, imidazolinium and ammonium radicals.

Among the double bases of formula (IV) above, mention may be made more particularly of N,N'-bis(β-hydroxyethyl)-N,N'-bis(4'-aminophenyl)-1,3-diaminopropanol, N,N'-bis(β-hydroxyethyl)-N,N'-bis(4'-aminophenyl)ethylenediamine, N,N'-bis(4-aminophenyl)tetramethylenediamine, N,N'-bis(β-hydroxyethyl)-N,N'-bis(4-aminophenyl)-

tetramethylenediamine, N,N'-bis(4-methylaminophenyl)tetramethylenediamine, N,N'-bis(ethyl)-N,N'-bis(4'-amino-3'-methylphenyl)ethylenediamine and 1,8-bis(2,5-diaminophenoxy)-3,5-dioxaoctane, and the addition salts thereof with an acid.

Among these double bases of formula (IV), N,N'-bis(β-hydroxyethyl)-N,N'-bis(4'-aminophenyl)-1,3-diaminopropanol and 1,8-bis(2,5-diaminophenoxy)-3,5-dioxaoctane, or one of the addition salts thereof with an acid, are particularly preferred.

Among the para-aminophenols which can be used as oxidation bases in the dye compositions in accordance with the invention, mention may be made in particular of the compounds of formula (V) below, and the addition salts thereof with an acid:



in which:

- R₂₂ represents a hydrogen or halogen atom or a C₁-C₄ alkyl, C₁-C₄ monohydroxyalkyl, (C₁-C₄) alkoxy(C₁-C₄) alkyl, C₁-C₄ aminoalkyl or hydroxy(C₁-C₄) alkylamino(C₁-C₄) alkyl radical,

- R_{23} represents a hydrogen or halogen atom or a C_1 - C_4 alkyl, C_1 - C_4 monohydroxyalkyl, C_2 - C_4 polyhydroxyalkyl, C_1 - C_4 aminoalkyl, cyano(C_1 - C_4)alkyl or (C_1 - C_4)alkoxy(C_1 - C_4)alkyl radical,
- 5 it being understood that at least one of the radicals R_{22} and R_{23} represents a hydrogen atom.

Among the para-aminophenols of formula (V) above, mention may be made more particularly of para-aminophenol, 4-amino-3-methylphenol, 4-amino-3-10 fluorophenol, 4-amino-3-hydroxymethylphenol, 4-amino-2-methylphenol, 4-amino-2-hydroxymethylphenol, 4-amino-2-methoxymethylphenol, 4-amino-2-aminomethylphenol, 4-amino-2-(β -hydroxyethylaminomethyl)phenol and 4-amino-2-fluorophenol, and the addition salts thereof with an 15 acid.

Among the ortho-aminophenols which can be used as oxidation bases in the dye compositions in accordance with the invention, mention may be made more particularly of 2-aminophenol, 2-amino-5-methylphenol, 20 2-amino-6-methylphenol and 5-acetamido-2-aminophenol, and the addition salts thereof with an acid.

Among the heterocyclic bases which can be used as oxidation bases in the dye compositions in accordance with the invention, mention may be made more 25 particularly of pyridine derivatives, pyrimidine derivatives and pyrazole derivatives, and the addition salts thereof with an acid.

Among the pyridine derivatives, mention may be made more particularly of the compounds described, for example, in GB patents 1,026,978 and 1,153,196, such as 2-5-diaminopyridine, 2-(4-methoxyphenyl)amino-5-3-aminopyridine, 2,3-diamino-6-methoxypyridine, 2-(β -methoxyethyl)amino-3-amino-6-methoxypyridine and 3,4-diaminopyridine, and the addition salts thereof with an acid.

Among the pyrimidine derivatives, mention may 10 be made more particularly of the compounds described, for example, in German patent DE 2,359,399 or Japanese patents JP 88-169,571 and JP 91-333,495 or patent applications WO 96/15765, such as 2,4,5,6-tetraaminopyrimidine, 4-hydroxy-2,5,6-15 triaminopyrimidine, 2-hydroxy-4,5,6-triaminopyrimidine, 2,4-dihydroxy-5,6-diaminopyrimidine and 2,5,6-traminopyrimidine, and pyrazolopyrimidine derivatives, such as those mentioned in patent application FR-A-2,750,048 and among which mention may be made of 20 pyrazolo[1,5-a]pyrimidine-3,7-diamine; 2,5-dimethylpyrazolo[1,5-a]pyrimidine-3,7-diamine; 25 pyrazolo[1,5-a]pyrimidine-3,5-diamine; 2,7-dimethylpyrazolo[1,5-a]pyrimidine-3,5-diamine; 3-aminopyrazolo[1,5-a]pyrimidin-7-ol; 3-aminopyrazolo[1,5-a]pyrimidin-5-ol; 2-(3-aminopyrazolo[1,5-a]pyrimidin-7-ylamino)ethanol, 2-(7-aminopyrazolo[1,5-a]pyrimidin-3-ylamino)ethanol, 2-[(3-aminopyrazolo[1,5-a]pyrimidin-7-yl)-(2-

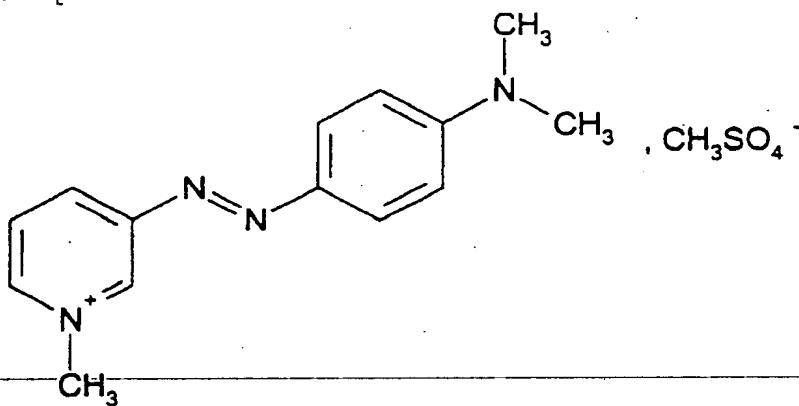
hydroxyethyl)amino]ethanol, 2-[(7-aminopyrazolo[1,5-a]pyrimidin-3-yl)-(2-hydroxyethyl)amino]ethanol, 5,6-dimethylpyrazolo[1,5-a]pyrimidine-3,7-diamine, 2,6-dimethylpyrazolo[1,5-a]pyrimidine-3,7-diamine and 2,5,5 N7,N7-tetramethylpyrazolo[1,5-a]pyrimidine-3,7-diamine, and the addition salts thereof and the tautomeric forms thereof, when a tautomeric equilibrium exists, and the addition salts thereof with an acid.

Among the pyrazole derivatives, mention may 10 be made more particularly of the compounds described in patents DE 3,843,892 and DE 4,133,957 and patent applications WO 94/08969, WO 94/08970, FR-A-2,733,749 and DE 195 43 988, such as 4,5-diamino-1-methylpyrazole, 3,4-diaminopyrazole, 4,5-diamino-1-(4'-chlorobenzyl)pyrazole, 4,5-diamino-1,3-dimethylpyrazole, 4,5-diamino-3-methyl-1-phenylpyrazole, 4,5-diamino-1-methyl-3-phenylpyrazole, 4-amino-1,3-dimethyl-5-hydrazinopyrazole, 1-benzyl-4,5-diamino-3-methylpyrazole, 4,5-diamino-3-tert-butyl-1-methylpyrazole, 4,5-diamino-1-tert-butyl-3-methylpyrazole, 4,5-diamino-1-(β -hydroxyethyl)-3-methylpyrazole, 4,5-diamino-1-ethyl-3-methylpyrazole, 4,5-diamino-1-ethyl-3-(4'-methoxyphenyl)pyrazole, 4,5-diamino-1-ethyl-3-hydroxymethylpyrazole, 4,5-diamino-3-hydroxymethyl-1-methylpyrazole, 4,5-diamino-3-hydroxymethyl-1-isopropylpyrazole, 4,5-diamino-3-methyl-1-isopropylpyrazole, 4-amino-5-(2'-aminoethyl)amino-1,3-dimethylpyrazole,

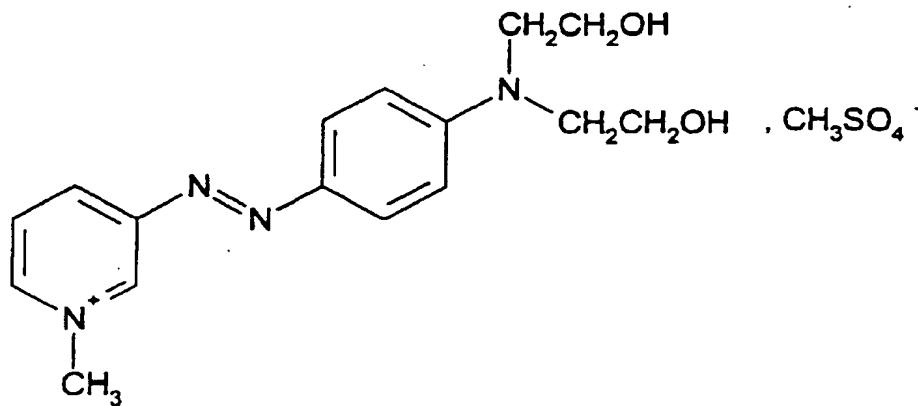
3,4,5-triaminopyrazole, 1-methyl-3,4,5-triaminopyrazole, 3,5-diamino-1-methyl-4-methylaminopyrazole and 3,5-diamino-4-(β -hydroxyethyl)amino-1-methylpyrazole, and the addition
5 salts thereof with an acid.

The oxidation base(s) preferably represent(s) from 0.0005 to 12% by weight approximately relative to the total weight of the dye composition in accordance with the invention, and even more preferably from 0.005
10 to 6% by weight approximately relative to this weight.

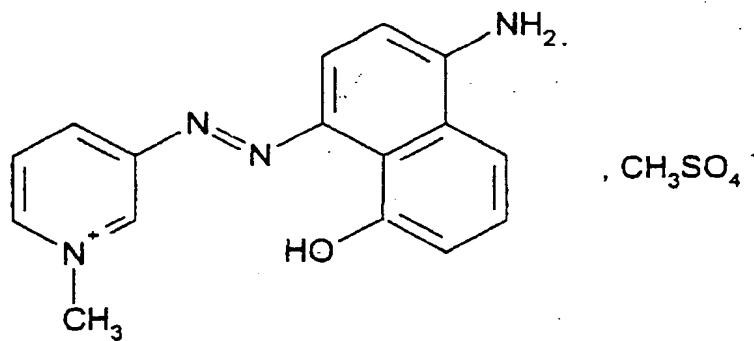
The 3-aminopyridine derivative(s) of formula (I) in accordance with the invention is (are) preferably chosen from:
- 4'-dimethylaminobenzene-1'-azo-1-methyl-3-pyridinium
15 methosulphate of formula:



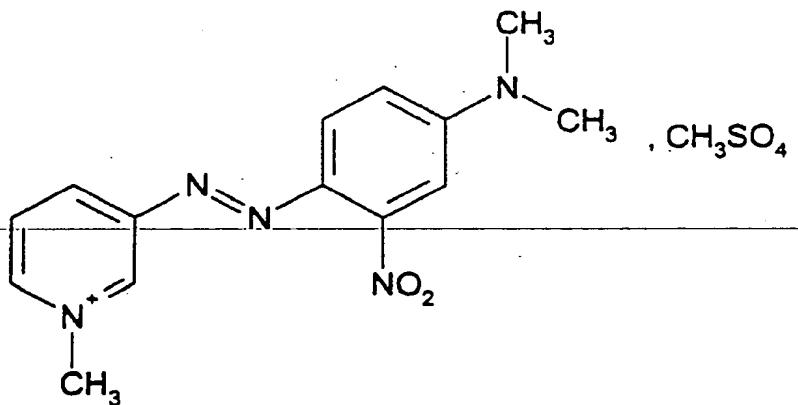
- 4'-bis(β -hydroxyethyl)aminobenzene-1'-azo-1-methyl-3-pyridinium methosulphate of formula:



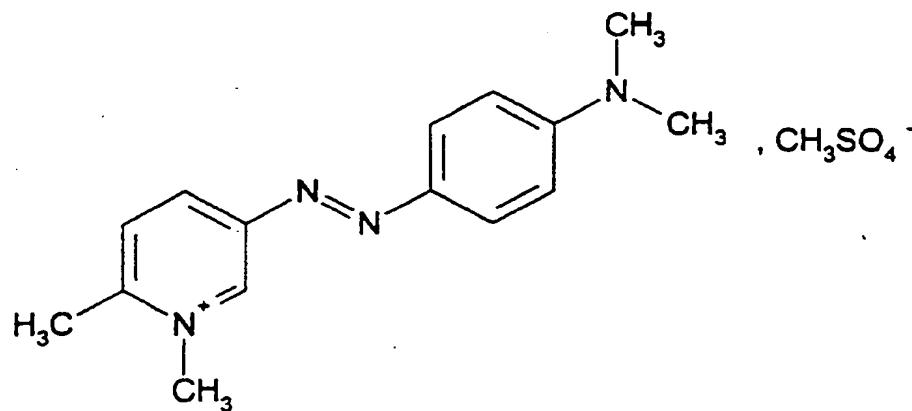
- 4'-amino-8'-hydroxynaphthalene-1'-azo-1-methyl-3-pyridinium methosulphate of formula:



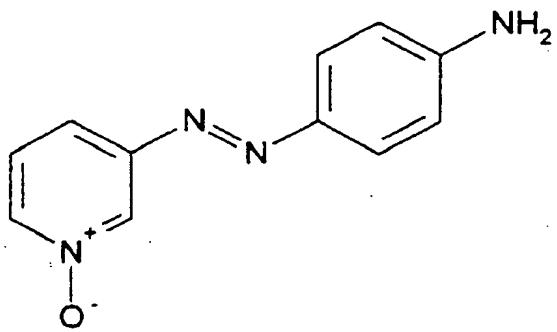
5 - 4'-dimethylamino-2'-nitrobenzene-1'-azo-1-methyl-3-pyridinium methosulphate of formula:



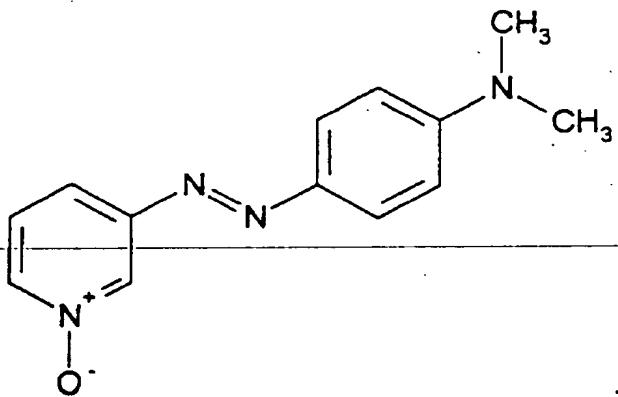
- 4'-dimethylaminobenzene-1'-azo-1,6-dimethyl-3-pyridinium methosulphate of formula:



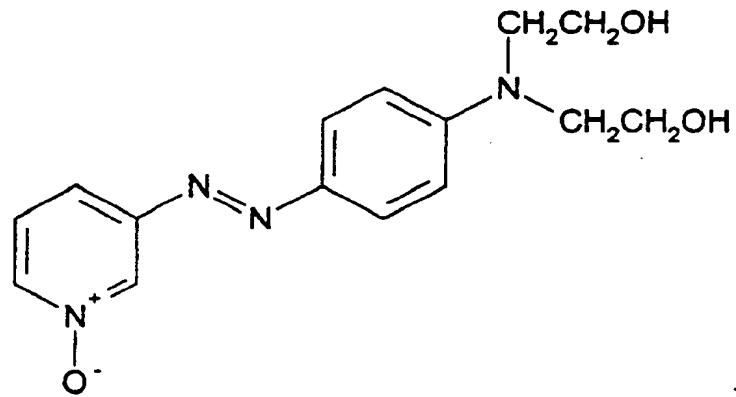
- 4'-aminobenzene-1'-azo-3-pyridine N-oxide of formula:



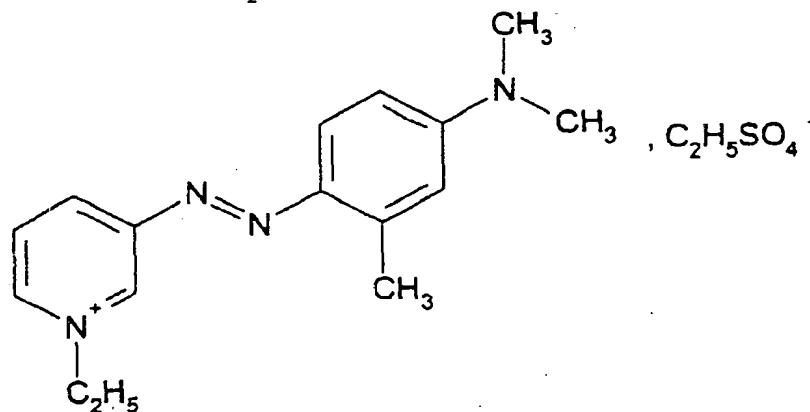
- 4'-dimethylaminobenzene-1'-azo-3-pyridine N-oxide of
5 formula:



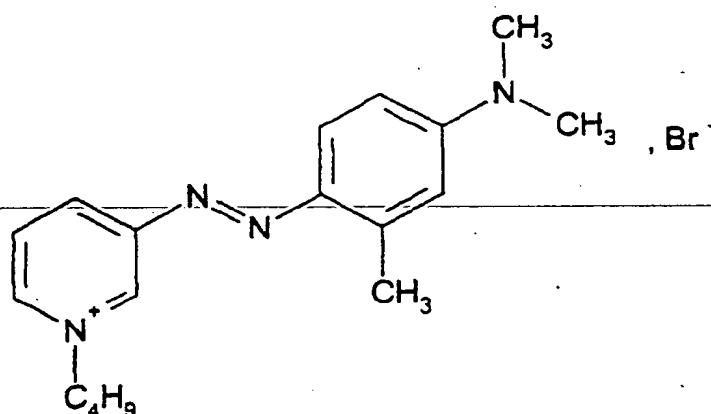
- 4'-N,N-bis(β -hydroxyethyl) aminobenzene-1'-azo-3-
pyridine N-oxide of formula:



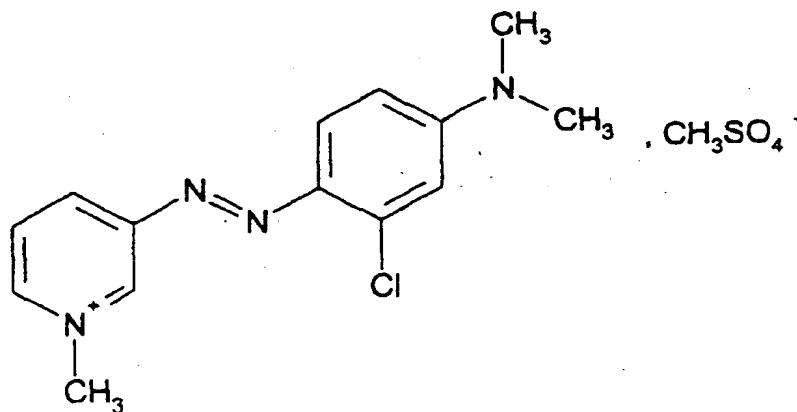
- 4'-dimethylamino-2'-methylbenzene-1'-azo-1-ethyl-3-pyridinium ethosulphate of formula:



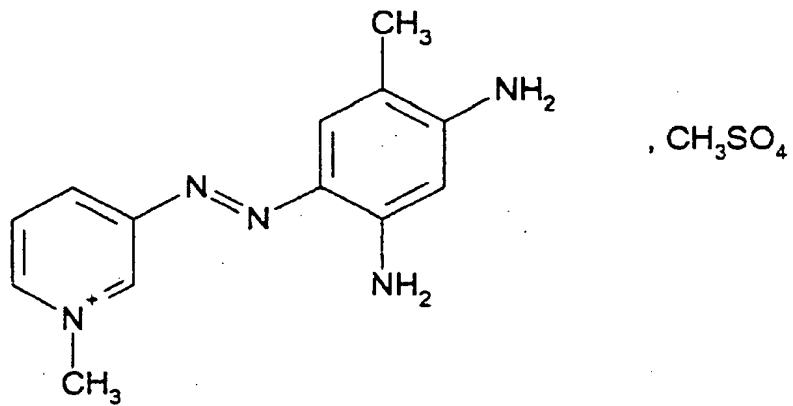
5 - 4'-dimethylamino-2'-methylbenzene-1'-azo-1-butyl-3-pyridinium bromide of formula:



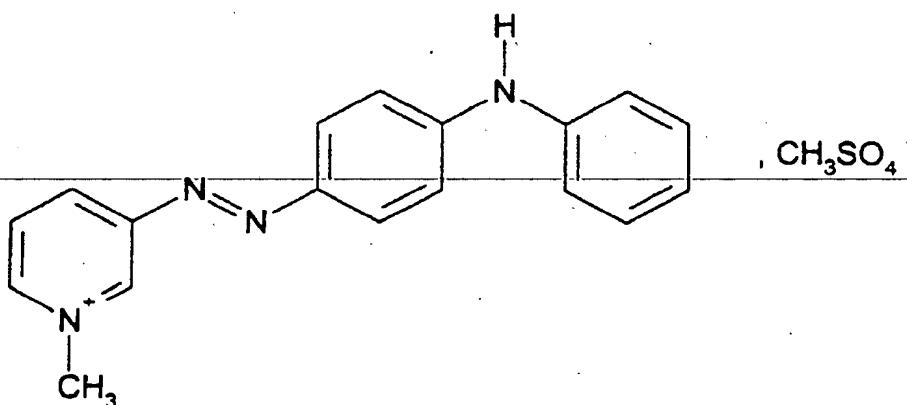
- 4'-dimethylamino-2'-chlorobenzene-1'-azo-1-methyl-3-pyridinium methosulphate of formula:



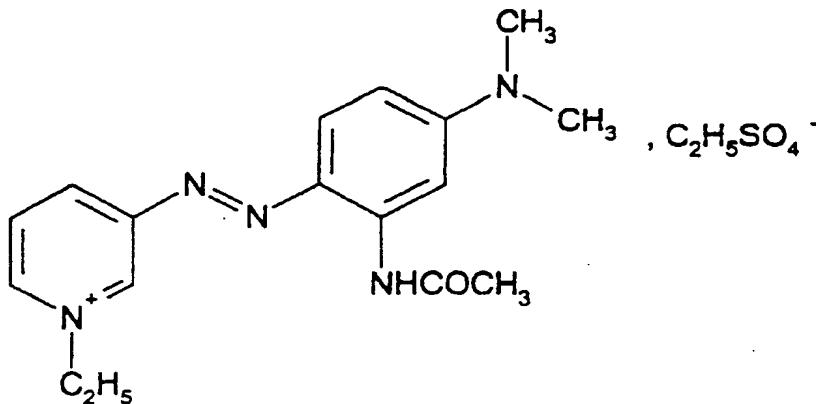
- 2',4'-diamino-5'-methylbenzene-1'-azo-1-methyl-3-pyridinium methosulphate of formula:



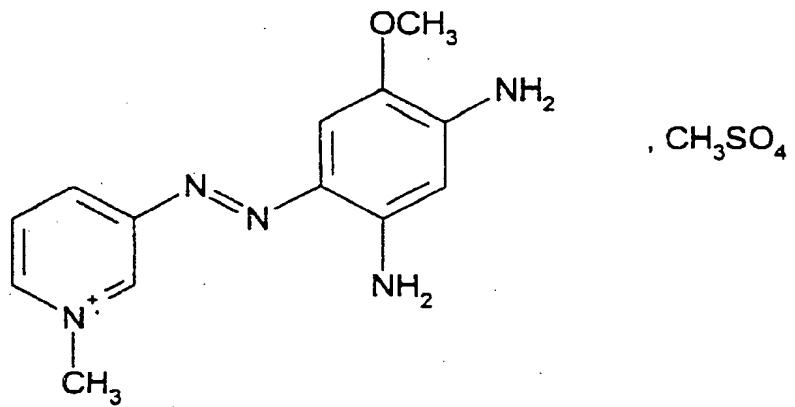
5 - 4'-phenylaminobenzene-1'-azo-1-methyl-3-pyridinium methosulphate of formula:



- 2'-acetylamino-4'-dimethylaminobenzene-1'-azo-1-ethyl-3-pyridinium ethosulphate of formula:

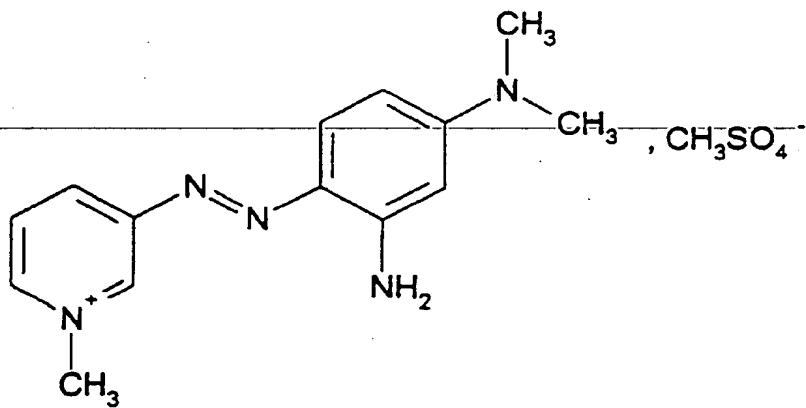


- 2',4'-diamino-5'-methoxybenzene-1'-azo-1-methyl-3-pyridinium methosulphate of formula:



5 and

- 2'-amino-4'-dimethylaminobenzene-1'-azo-1-methyl-3-pyridinium methosulphate of formula:



The 3-aminopyridine derivative(s) of formula

10 (I) used according to the invention preferably

represent(s) from 0.001 to 10% by weight approximately relative to the total weight of the dye composition, and even more preferably from 0.01 to 5% by weight approximately relative to this weight.

5 Among the meta-aminophenols of formula (II) above, mention may be made more particularly of 5-amino-2-methoxyphenol, 5-amino-2-(β -hydroxyethoxy)phenol, 5-amino-2-methylphenol, 5-N-(β -hydroxyethyl)amino-2-methylphenol, 5-N-(β -hydroxyethyl)amino-4-methoxy-2-methylphenol, 5-amino-4-methoxy-2-methylphenol, 5-amino-4-chloro-2-methylphenol, 5-amino-2,4-dimethoxyphenol, 5-(γ -hydroxypropylamino)-2-methylphenol, 3-amino-2-chloro-6-methylphenol, 3-amino-6-chlorophenol and 3-(β -aminoethyl)amino-6-chlorophenol, and the addition salts thereof with an acid.

The meta-aminophenol derivative(s) of formula (II) in accordance with the invention preferably represent(s) from 0.0001 to 10% by weight approximately relative to the total weight of the dye composition and even more preferably from 0.005 to 5% by weight approximately relative to this weight.

The dye composition in accordance with the invention can also contain one or more couplers other 25 than the meta-aminophenol derivatives of formula (II) and/or one or more direct dyes other than the 3-aminopyridine derivatives of formula (I), in

particular to modify the shades or to enrich them with glints.

Among the couplers which may also be present in the dye composition in accordance with the invention, mention may be made in particular of meta-phenylenediamines, meta-diphenols and heterocyclic couplers, and the addition salts thereof with an acid.

When they are present, these additional couplers preferably represent from 0.0001 to 10% by weight approximately relative to the total weight of the dye composition and even more preferably from 0.005 to 5% by weight approximately relative to this weight.

In general, the addition salts with an acid which can be used in the context of the dye compositions of the invention (oxidation bases and couplers) are chosen in particular from the hydrochlorides, hydrobromides, sulphates, tartrates, lactates and acetates.

The medium which is suitable for dyeing (or support) for the dye composition in accordance with the invention generally consists of water or of a mixture of water and at least one organic solvent to dissolve the compounds which would not be sufficiently soluble in water. Organic solvents which may be mentioned, for example, are C₁-C₄ alkanols, such as ethanol and isopropanol.

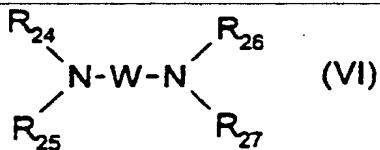
The solvents can be present in proportions preferably of between 1 and 40% by weight approximately

relative to the total weight of the dye composition, and even more preferably between 5 and 30% by weight approximately.

The pH of the dye composition in accordance with the invention is generally between 3 and 12 approximately, and preferably between 5 and 12 approximately. It can be adjusted to the desired value by means of acidifying or basifying agents usually used for dyeing keratin fibres.

Among the acidifying agents which may be mentioned, for example, are inorganic or organic acids such as hydrochloric acid, orthophosphoric acid, sulphuric acid, carboxylic acids such as acetic acid, tartaric acid, citric acid or lactic acid, and sulphonic acids.

Among the basifying agents which may be mentioned, for example, are aqueous ammonia, alkaline carbonates, alkanolamines such as mono-, di- and triethanolamine, 2-methyl-2-aminopropanol and derivatives thereof, sodium hydroxide, potassium hydroxide and the compounds of formula (VI) below:



in which W is a propylene residue optionally substituted with a hydroxyl group or a C₁-C₄ alkyl radical; R₂₄, R₂₅, R₂₆ and R₂₇, which may be identical or

different, represent a hydrogen atom or a C₁-C₄ alkyl or C₁-C₄ hydroxyalkyl radical.

The dye composition in accordance with the invention can also contain various adjuvants

5 conventionally used in compositions for dyeing the hair.

Needless to say, a person skilled in the art will take care to select this or these optional additional compounds such that the advantageous properties intrinsically associated with the dye composition in accordance with the invention are not, or are not substantially, adversely affected by the addition or additions envisaged.

The dye composition in accordance with the invention can be in various forms, such as in the form of liquids, creams or gels, which are optionally pressurized, or in any other form which is suitable for dyeing keratin fibres, and in particular human hair.

A subject of the invention is also a process
20 for dyeing keratin fibres, and in particular human
keratin fibres such as the hair, using the dye
composition as defined above.

According to this process, the dye composition as defined above is applied to the fibres, 25 the colour being developed at acidic, neutral or alkaline pH with the aid of an oxidizing agent which is added to the dye composition only at the time of use, or which is present in an oxidizing composition that is

applied simultaneously or sequentially in a separate manner.

According to a particularly preferred embodiment of the dyeing process according to the 5 invention, the dye composition described above is mixed, at the time of use, with an oxidizing composition containing, in a medium which is suitable for dyeing, at least one oxidizing agent present in an amount which is sufficient to develop a coloration. The 10 mixture obtained is then applied to the keratin fibres and is left on them for 3 to 50 minutes approximately, preferably 5 to 30 minutes approximately, after which the fibres are rinsed, washed with shampoo, rinsed again and dried.

15 The oxidizing agent present in the oxidizing composition as defined above can be chosen from the oxidizing agents conventionally used for the oxidation dyeing of keratin fibres, and among which mention may be made of hydrogen peroxide, urea peroxide, alkali 20 metal bromates, persalts such as perborates, percarbonates and persulphates, peracids, enzymes such as 2-electron oxidoreductases, peroxidases and lactases. Hydrogen peroxide is particularly preferred.

The pH of the oxidizing composition 25 containing the oxidizing agent as defined above is such that, after mixing with the dye composition, the pH of the resulting composition applied to the keratin fibres preferably ranges between 3 and 12 approximately and

even more preferably between 5 and 11. It is adjusted to the desired value by means of acidifying or basifying agents usually used for dyeing keratin fibres and are as defined above.

5 The oxidizing composition as defined above can also contain various adjuvants conventionally used in compositions for dyeing the hair and as defined above.

10 The composition which is finally applied to the keratin fibres can be in various forms, such as in the form of liquids, creams or gels or in any other form which is suitable for dyeing keratin fibres, and in particular human hair.

15 Another subject of the invention is a multi-compartment dyeing device or multi-compartment dyeing "kit", or any other multi-compartment packaging system, a first compartment of which contains the dye composition as defined above and a second compartment of which contains the oxidizing composition as defined 20 above. These devices may be equipped with a means for applying the desired mixture to the hair, such as the devices described in patent FR-2,586,913 in the name of the Applicant.

25 The examples which follow are intended to illustrate the invention without thereby limiting its scope.

EXAMPLES

COMPARATIVE DYEING EXAMPLES 1 TO 4

The dye compositions below were prepared

5 (contents in grams) :

EXAMPLE	1	2 (*)	3	4 (*)
4'-Dimethylaminobenzene-1'-azo-3-pyridine N-oxide (compound of formula (I))	0.5	0.5	-	-
2'-Acetylamino-4'-dimethylaminobenzene-1'-azo-1-ethyl-3-pyridinium ethosulphate (compound of formula (I))	-	-	0.6	0.6
para-Phenylenediamine (oxidation base)	0.324	0.324	0.324	0.324
5-Amino-2-methylphenol (coupler of formula (II))	0.369	-	0.369	-
meta-Aminophenol (coupler)	-	0.327	-	0.327
Common dye support	(**)	(**)	(**)	(**)
Demineralized water qs	100 g	100 g	100 g	100 g

(*) : Comparative example not forming part of the invention

10

(**) : Common dye support:

-Oleyl alcohol polyglycerolated with 2 mol of glycerol	4.0	g
-Oleyl alcohol polyglycerolated with 4 mol of glycerol, containing 78% active material (A.M.)	5.69	g A.M.
-Oleic acid	3.0	g
-Oleylamine containing 2 mol of ethylene oxide, sold under the trade name Ethomeen O12® by the company Akzo	7.0	g
-Diethylaminopropyl laurylaminosuccinamate, sodium salt, containing 55% A.M.	3.0	g A.M.
-Oleyl alcohol	5.0	g
-Oleic acid diethanolamide	12.0	g
-Propylene glycol	3.5	g
-Ethyl alcohol	7.0	g
-Dipropylene glycol	0.5	g
-Propylene glycol monomethyl ether	9.0	g
-Sodium metabisulphite as an aqueous solution containing 35% A.M.	0.455	g A.M.
-Ammonium acetate	0.8	g
-Antioxidant, sequestering agent	qs	
-Fragrance, preserving agent	qs	
-Aqueous ammonia containing 20% NH ₃	10.0	g

Each of the dye compositions described above
was mixed, at the time of use, with an equivalent

weight-amount of 20-volumes hydrogen peroxide (6% by weight) having a pH of about 3.

Each resulting mixture had a pH of about 10 ± 0.2 and was applied for 30 minutes to locks of 5 permanent-waved grey hair containing 90% white hairs.

The hair was then rinsed with water, washed with a standard shampoo, rinsed again and then dried.

The colour of the locks was evaluated before and after dyeing, in the Munsell system, using a 10 Minolta CM 2002® spectrophotometer.

According to the Munsell notation, a colour is defined by the formula:

$$HV / C$$

in which the three parameters denote, respectively, the 15 "Hue" or shade (H), the "Value" or intensity (V) and the "Chroma" or saturation (C), the oblique line simply being a convention and not denoting a ratio.

The increase in the coloration ΔE can be calculated by applying the Nickerson equation:

20

$$\Delta E = 0.4C_0dH + 6dV + 3dC$$

as described, for example, in "Journal of the Optical Society of America", vol. 34, No. 9, Sept 1944, pages 25 550-570.

In this equation, ΔE represents the difference in colour between two locks (in the present case the increase in the coloration), dH , dV and dC

represent the variation in absolute value of the three parameters H, V and C, C₀ representing the saturation of the lock relative to which it is desired to evaluate the difference in colour.

5 The greater the value of ΔE, the greater the difference in colour between the two locks, and, in the present case, the greater the increase in the coloration (or intensity of the coloration).

The results are given in the table below:

10

Example	Colour of the lock before dyeing	Colour of the lock after dyeing	Increase in coloration			
			dH	dV	dC	ΔE
1	3.3 Y 5.8/1.6	6.5 R 2.7/3.8	16.8	3.1	2.2	36.0
2 (*)	3.3 Y 5.8/1.6	1.2 YR 2.4/2.1	12.1	3.4	0.5	29.6
3	3.3 Y 5.8/1.6	5.1 R 2.5/3.0	18.2	3.3	1.4	35.6
4 (*)	3.3 Y 5.8/1.6	8.7 R 2.2/1.5	14.6	3.6	0.1	31.2

(*) Comparative example not forming part of the invention

15

It is found that the dye compositions of Examples 1 and 3 in accordance with the invention, i.e. compositions containing a combination of a direct dye of formula (I), an oxidation base and a coupler of formula (II), lead to more intense colorations than the

20 dye compositions of Examples 2 and 4 not forming part

of the invention since they contain an unsubstituted coupler of meta-aminophenol type and as described, for example, in patent application FR-A-2,285,851.